On the expected Reappearance of the celebrated Comet of 1264 and 1556. By Mr. Hind.

"The time is now near at hand when the return of the comet of 1264 and 1556, signalised by Mr. Dunthorne and M. Pingré, may be expected to take place. It is, therefore, desirable that observers should be in possession of every thing that may tend to facilitate their search for the comet; and I venture to communicate to the Society the results of some recent calculations of my own on the subject, preceded by a very brief view of the principal circumstances connected with former appearances of the comet, and a short notice of calculations already published.

"'The great and celebrated comet' of 1264, as Pingré terms it, is mentioned by nearly all the European historians of the time, and was observed by the astronomers of the dynasties then reigning in the north and south of China. It is described as presenting a most imposing appearance, with a tail 100° in length, stretching from the east part of the 'mid-heaven.' The comet was of 'surprising magnitude,' far exceeding any remembered by those who beheld it. Contemporary writers generally considered it the precursor of the death of Pope Urban IV., and many of them relate that it disappeared on the same night that the Pope died, or on October 2; thus, in the words of Thierri de Vaucouleurs,

> 'Quo (Urbano) moriente, velut mortem cognosceret ejus
> Apparens minimè stella comata fuit.'

"In 1556 the appearance of the comet was not on the same scale of splendour as in 1264, but still was sufficiently imposing to call forth from historians the epithets 'ingens et lucidum sidus.' It was observed by Paul Fabricius, a mathematician and physician at the court of the Emperor Charles V. of Austria. M. Pingré, the celebrated cometographer, sought in vain for the original observations; the only information he could find on the subject was contained in a small rough chart found in Lycosthenes and other authors. I have before* suggested the probability that these observations were given by Fabricius in his work upon the comet, published at Nürnberg in 1556, and mentioned by Lalande in his *Bibliographie*; but, as far as I am aware, this work has not been discovered in any library. M. Pingré would have at his command the splendid collections of St. Genevieve and the Royal Library at Paris, and his ineffectual search for the observations in these libraries makes it at least doubtful whether they are now in existence. The chart just mentioned enables us to form a tolerably definite idea of the path followed by the comet, and we have ample information for a rough determination of the elements.

"When Halley published his *Synopsis of Cometary Astronomy*, he gave a set of parabolic elements for the comet of 1556, founded

* Ast. Nach. 493.

upon the observations made by Paul Fabricius; but he remarks that these elements are not so certain as those of other comets he had computed, the observations being made 'neither with sufficient instruments nor due care,' and by no means to be reconciled with any regular calculation.

"The elements of the comet of 1264 were first computed by Mr. Dunthorne. His discussion of the observations and circumstances relating to the comet's apparition are published in vol. xlvii. of the *Philosophical Transactions*. The elements are chiefly founded on the authority of a manuscript preserved in the library of Pembroke Hall College, Cambridge, entitled *Tractatus fratris Ægidii de Cometis*. But it must be observed there are manifest contradictions in this account not easily set right. The other authorities consulted were the *Chronicon Sampetrinum Erphurtense* and the *Chronicle of John Vitoduranus*. The orbit deduced by Mr. Dunthorne much resembles that calculated by Halley for the comet of 1556.

"In the *Memoirs of the Royal Academy of Sciences at Paris* for 1760, appears a valuable memoir by M. Pingré on the comet of 1264. After collecting together a great number of accounts from different chronicles and histories of the day, he proceeds to the discussion of the elements. The contradiction in the Cambridge manuscript which relates to the comet's motion in longitude is pointed out; and since this manuscript was Mr. Dunthorne's chief authority, it might be supposed that his orbit would differ entirely from M. Pingré's. This, however, was not the case; for although there are differences of some moment in one or two of the elements, there is still a striking similarity between the two orbits taken as a whole, and M. Pingré's approaches much nearer than Mr. Dunthorne's to the orbit of the comet of 1556. A closer agreement might have been produced if he had not wished to preserve the path laid down by Thierri de Vaucouleurs with as little alteration as possible. M. Pingré concludes from his researches that there is little doubt of the identity of the comets of 1264 and 1556, and, therefore, that the return to perihelion may be expected to take place in the year 1848. In No. 493 of the *Astronomische Nachrichten* will be found the results of my first calculations relating to this comet. I have there deduced elements from the observations by Fabricius in 1556, and computed an ephemeris for comparison with the comet's observed path. The agreement, though not so close as could be wished, was the best that could be obtained from the data given by M. Pingré in his *Cometography*. I then reduced the elements to the year 1264, and with the assistance of a passage in Thierri's poem, I fixed the time of perihelion for July 9·9 (old style). The passage alluded to is as follows:—

'Undecimumque gradum Phœbo superante Leonis,
Ter deno Cancri restitit illa loco.'

"With M. Pingré, I have understood by '*Ter deno Cancri*,'

the 120th degree of longitude; but I am not quite sure that this is the true interpretation.

"With perihelion and node reduced as before stated, and the other elements as for 1556, an ephemeris of the comet's geocentric path in 1264 was computed. During the month of July, calculation and observation agree pretty well; but after the beginning of August the theoretical places entirely differ from the positions of the comet, as deduced from the accounts. Instead of traversing *Orion* towards the end of its appearance, as some historians relate, it would take a higher declination, passing through *Auriga* and *Taurus*.

"Since the publication of this paper in the *Astronomische Nachrichten*, I have made some further investigations on the subject, and with more success than in my first calculations. A closer comparison of data shewed pretty clearly that the observation of March 5, on which I had chiefly relied, must be erroneous as it is given by M. Pingré. In tome i. of his *Cometography*, p. 503, we learn that on March 5 the comet was almost in the right line joining the stars γ and θ *Virginis*, and was equidistant from the stars. A trigonometrical calculation from these data gives the place of the comet in longitude 188° 1′, and latitude + 2° 19′, and this position was employed in my earlier investigations. But I have recently satisfied myself, that the observation as given above cannot be reconciled with those of March 3 and 4, and on subsequent days, by any set of elements. The cause of this anomaly is, I believe, an error in the name of the star. If instead of γ and θ *Virginis* we read δ and θ, then the place of the comet would be in longitude 188° 41′, and latitude + 5° 13′, which agrees very well with the track which the comet ought to have followed, according to the other observations.

"A recalculation of the elements from an interpolated position for March 5, and from those of March 9 and 14, gives the following values,—

Passage through Perihelion, 1556, April 22·0233, G. M. T. [Old Style.]

Longitude of Perihelion	274° 14′·9	Equinox of 1556.
Ascending Node	175 25·8	
Inclination	30 12·2	
Log. least distance	9·70323	

Motion direct.

"The following Ephemeris of the Comet for the appearance in 1556, Greenwich Mean Midnight, Old Style, is deduced from these elements,—

~~1836.~~ Old Style.	Geo. Long.	Geoc. Lat.	Log. r.	Δ
March 3	188° 13′	+ 1° 9′	0·0732	0·193
4	188 0	3 40	0·0670	0·175
5	187 44	6 45	0·0606	0·157
6	187 22	10 36	0·0541	0·140
7	186 54	15 29	0·0476	0·124
8	186 14	21 43	0·0409	0·109
9	185 18	29 49	0·0341	0·096
10	183 49	40 12	0·0272	0·085
11	181 11	52 50	0·0201	0·078
12	175 21	67 5	0·0130	0·075
13	153 35	80 29	0·0057	0·078
14	55 19	82 30	9·9983	0·085
15	27 16	73 26	9·9908	0·095
16	20 37	65 30	9·9831	0·108
17	17 44	59 16	9·9753	0·122
27	12 19	34 58	9·8903	0·302
April 6	12 7	27 1	9·7959	0·505
16	14 13	20 30	9·7178	0·733
26	19 12	+13 52	9·7130	0·974

"If this ephemeris be compared with the descriptions of the comet's apparent path in the heavens we shall find the agreement as close as could be expected, considering the uncertainty and irregularity of the data.

"With the above elements reduced to 1264, the time of perihelion was found to be July 13·42, *i. e.* assuming, with Pingré, that the comet was in longitude 120° when the sun had reached the 11th degree of *Leo*, according to the narration of Thierri de Vaucouleurs. The geocentric places of the comet, Greenwich Mean Midnight, Old Style, would then be as follows:—

1264. Old Style.	Geo. Long.	Geoc. Lat.	r	Δ
July 7	138° 10′	+18° 14′	0·53	0·82
17	132 36	22 9	0·51	0·62
22	126 29	21 54	0·55	0·55
27	118 36	20 14	0·61	0·48
Aug. 6	101 14	+10 17	0·75	0·41
16	85 23	− 3 47	0·92	0·39
26	70 47	17 10	1·09	0·42
Sept. 5	56 39	27 8	1·26	0·48
15	43 11	33 4	1·43	0·57
25	31 35	35 26	1·59	0·69
Oct. 5	22 47	−35 30	1·75	0·84

"If we are to depend solely on the European accounts of this comet's path, the above is liable to two objections: first, too high a declination in August; and secondly, that the positions are in *Eridanus* during the latter part of the comet's apparition; historians generally contenting themselves with stating that the comet "finally traversed *Orion*." M. Pingré's elements, which are not open to these objections, do not agree so well as mine with the more circumstantial details left us in the Chinese Annals. The two orbits differ chiefly in the longitude of the node and perihelion distance, but the discordances are by no means great.

"The results of my calculations have satisfied me that the comet of 1264 was, in all probability, the same as that of 1556, and, consequently, that its return to perihelion must be very near at hand. The nodes of the comet's orbit lie very close to the earth's path. The ascending node is passed 50 days before perihelion, the radius vector being 1·193, and consequently the distance outside the earth's orbit about 0·197. The passage through descending node occurs $31\frac{1}{2}$ days after perihelion, and the distance of the point from the earth's orbit inside is 0·126. However, the nearest approach of the comet to the earth will not happen at the nodes, but soon after its passage through them; thus, in 1556 the least distance between the two bodies was 0·074, nine days after the transit through ascending node. The effect of this close proximity to our globe on the period of revolution of the comet has been investigated by Professor Mädler, of the Dorpat Observatory, as detailed in No. 501 of the *Astronomische Nachrichten*: it amounted to $14\frac{1}{2}$ days only, and the return of the comet to perihelion was fixed for the end of February, 1848.

"The following table contains the heliocentric co-ordinates referred to the equator and the log. radii vectores of the comet in my last orbit, reduced to 1848, for every 10th day, from 90 days before to 90 days after perihelion.

Time from Perih. Pass.	x	y	z	Log. r.
Days.				
−90	−1·7430	+0·5750	−0·0603	0·2640
80	1·6231	0·4370	0·0445	0·2257
70	1·4931	0·2963	0·0284	0·1826
60	1·3504	0·1533	−0·0122	0·1333
50	1·1917	+0·0084	+0·0041	0·0762
40	1·0120	−0·1363	0·0206	0·0092
30	0·8039	0·2770	0·0363	9·9300
20	0·5570	0·4031	0·0501	9·8385
−10	−0·2611	0·4907	0·0592	9·7474
0	+0·0738	0·4961	0·0583	9·7032
+10	0·3929	0·3951	0·0450	9·7474
20	0·6507	0·2266	0·0239	9·8385
30	0·8503	−0·0352	+0·0004	9·9300
40	1·0086	+0·1590	−0·0233	0·0092
50	1·1385	0·3490	0·0463	0·0762
60	1·2484	0·5331	0·0685	0·1333
70	1·3433	0·7109	0·0900	0·1826
80	1·4268	0·8828	0·1107	0·2257
+90	+1·5015	+1·0492	−0·1307	0·2640

"With the above values for x, y, and z, and those of X, Y, Z, taken from the *Nautical Almanac*, the position of the comet for different suppositions as to the time of passage through perihelion may be readily obtained. If we suppose March 0, which is about the epoch fixed by Professor Mädler, we shall have the following ephemeris for facilitating the discovery of the comet, Mean Noon at Greenwich:—

1847–8.	R.A.	Decl.	Δ
Dec. 1	187° 16′	−11° 22′	2·16
11	193 55	12 56	1·92
21	201 52	14 29	1·68
31	211 43	15 52	1·46
Jan. 10	224 16	16 50	1·26
20	240 18	16 47	1·11
30	259 53	15 3	1·02
Feb. 9	281 23	11 24	1·03
19	302 15	7 1	1·13
29	321 18	3 23	1·29
Mar. 10	338 5	− 0 54	1·48
20	352 11	+ 0 50	1·66
30	3 50	2 9	1·84
April 9	13 32	3 11	2·01
19	21 46	3 59	2·17
29	28 52	4 35	2·32
May 9	35 5	4 58	2·46
19	40 36	5 11	2·59
29	45 31	+ 5 12	2·69

"It appears from this ephemeris, that, according to the most probable supposition we can make respecting the time of perihelion, without actual calculation of the perturbations, the position of the comet in the heavens during the approaching re-appearance will be extremely unfavourable for observation; and it is, therefore, the more desirable that those who look out for comets should be on the alert. Nearly the whole of the vast trajectory of this comet lies below the plane of the ecliptic, and *far from the paths of the larger planets*, but it extends into space more than twice the distance of *Neptune*, and surely we are not yet able to say what causes may operate, at this immense distance from the sun, to affect the time of the next return to perihelion. If, however, the comet can be detected and observed, we shall then have the means of ascertaining something more on these points."

Mr. Giles forwarded a sketch of a singularly beautiful arc of luminosity, which was seen over the town of Ipswich on the 18th of March. At $9\frac{1}{4}$ hours a faint diffused light was seen, which after a time condensed itself into an arc of brightish light, commencing at the N.N.E,. and dying away at the S.S.W. points. At the N.N.E., where it was broadest and brightest, Mr. Giles estimates its width at about $\frac{1}{2}^{\circ}$, the colour towards the other end had a tendency to ruddiness. The altitude is not estimated, but from the drawing seems to be considerable.*

* It would add very much to the value of this class of observation if several stars were noted near which the arcs or beams of light passed, and also the exact time of any marked change of appearance in the phenomena.

Erratum. In the No. for February last, page 137, line 37, *after* "Section 16 of the Bye-Laws," *insert* "and awarding a medal to M. Le Verrier."

Printed by George Barclay, Castle Street, Leicester Square.